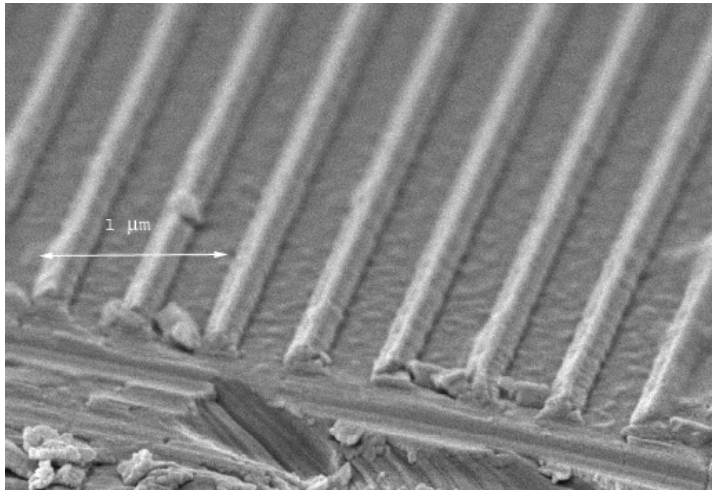
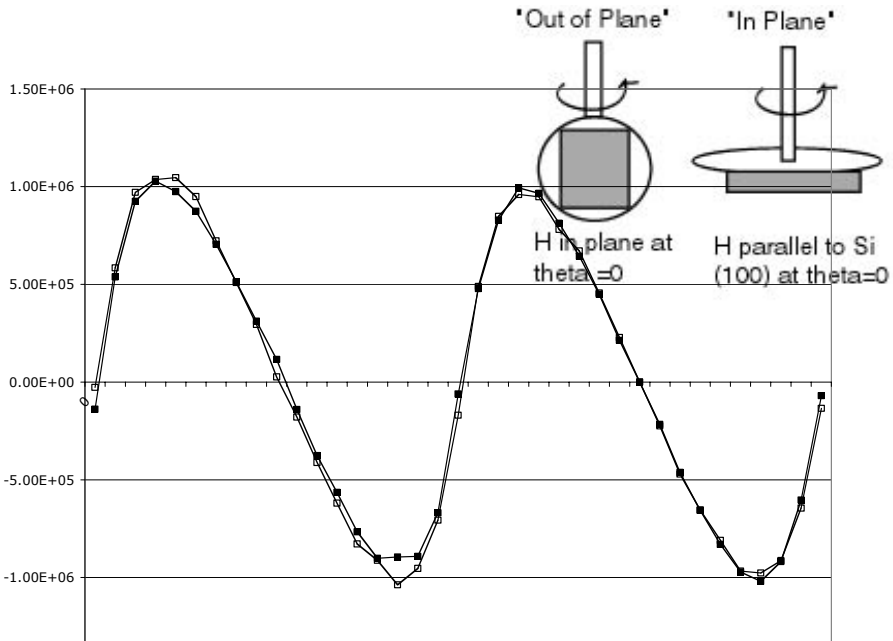
Misfit strain, dislocations and magnetism in epitaxial nanostructures
R.C. O'Handley, M.I.T., DMR-0105423

Continuous nickel films grown pseudo-epitaxially between copper layers have been shown to have strong perpendicular magnetic anisotropy due to large magnetoelastic and surface magnetocrystalline anisotropy energies. These nickel films have now been patterned into lines approximately 200 nm in width using interferometric lithography and ion milling. *Ex situ* vibrating sample and torque magnetometer measurements show the anisotropy of the nanolines to be significantly different from that of the continuous films. The magnetoelastic anisotropy (favoring perpendicular magnetization) decreases in the patterned films due to strain relaxation at the line edges. Analysis of the magnetostatic and magnetoelastic energy terms shows quantitatively how these effects combine to explain the data, allowing predictions of the anisotropy of patterned epitaxial structures.





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Education:

The graduate student supported on this program, Elizabeth Lyons, has volunteered to participate in the first semester offering of a new undergraduate lab class at M.I.T.. It was developed to integrate lab experience into the curriculum. The graduate students involved have an opportunity to bring into the lab class some of their graduate research experience. Elizabeth will be helping the students with ESCA and XPS studies of different types of materials, including, Ni, NiO, and CuNi alloys.

Outreach:

Elizabeth also teaches at the M.I.T. Society for Creative anachronism. Some of the material discussed at these meetings involves archeological metallurgy and early information technologies.